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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/849,886	05/04/2001	Yoshihide Kinbara	Q64212	9968

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EXAMINER	
PADGETT, MARIANNE L	
ART UNIT	**PAPER NUMBER**
1762	

DATE MAILED: 03/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/849,886	Kinbara, Yoshihide
Examiner	**Group Art Unit**
M. L. Padgett	1762

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

☒ Responsive to communication(s) filed on 10/21/03.

☐ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle,* 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1-9, 11-21 & 23-26 is/are pending in the application.

Of the above claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-9, 11-21 & 23-26 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claim(s) _____ are subject to restriction or election requirement

Application Papers

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)–(d)

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119 (a)–(d).

☐ All ☐ Some* ☐ None of the:

☐ Certified copies of the priority documents have been received.

☐ Certified copies of the priority documents have been received in Application No. _____.

☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a))

*Certified copies not received: _____.

Attachment(s)

☐ Information Disclosure Statement(s), PTO–1449, Paper No(s). _____

☒ Notice of Reference(s) Cited, PTO–892

☐ Notice of Draftsperson's Patent Drawing Review, PTO–948

☐ Interview Summary, PTO–413

☐ Notice of Informal Patent Application, PTO–152

☐ Other _____

Office Action Summary

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/21/03 has been entered.

2. Claims 1-9, 11-21 and 23-26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The amendment adding "the thin film determining a discharge start voltage of less than or equal to 20 V" (emphasis added) is only partially supported by the cited p.22, lines 18-20 disclosure, which states "...the discharge processing device of the present invention is set to several volts to 10 V, not more than 20 V at most." This disclosure requires a minimum of several volts, with alternative maximum volts of 10 or 20 volts, not all possible voltages from 0 to 20 V, or possibly been $-\infty$ to +20 volts, as presently claimed. Also "set to" done by the practitioner is a completely different concept from "determining" achieved by the film itself, so no enablement / support for how the thin film determines the voltage is found in the cited support, hence these claims are considered to include New Matter

3. Claims 1-9, 11-21 and 23-26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The New Matter discussed above in section 1, also lacks enablement.

4. Claims 1-9 and 11-12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, in the last 3 lines, the "controlling..." limitation is unclear, as it is uncertain when some of the parameters of the Markush group are to be changed in order to provide the claimed controlling. In the case of "viscosity", does the claim language mean that the viscosity is changed during the processing of each particular subject; or can it read on changing or replacing the processing medium in the apparatus during set-up for the discharge treatment. Use of a medium in the process could change its viscosity due to contamination (during treatment), hence replacement would effect change and control (between). Either heating or cooling will modify, thus control a liquid medium viscosity during processing, as would adding or changing concentration of dilutants, if medium flows through device. As presently written any such option will be considered.

5. "Pressing pressure", "contact area..." and relative shelf are clear in context as being during the discharging or at its start. Note movement between electrode and subject will inherently change the location of the contact area on either or both of the electrode and/or subject, thus changes the thickness of the film when lateral shifting occurs from what the medium thickness was when not between the two objects, to the dimensions of the gap there- between. The type of "moving" is NOT limited in the claims, hence the shifting rate may refer to rotational or lateral or vertical movement, as presently written in either method or device claims.

It is further noted, that while the original claims were examined as a film forming process, the present claims are no longer directed to film formation *per se*, as the "thin film" described therein is a description of the dimensions of the processing medium, NOT (necessarily) a coating formed on the substrate being discharge treated. Presently no particular effect to the subject is required to be effected by

the claimed discharged method, nor any particular capability required of the apparatus with respect to any substrate (subject) it treats.

6. Claims 1, 3-9, 11-13, 15-21 and 23-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

While "thin film" in the coating arts is considered to be an art recognized term for a range of coating thickness, outside that usage it remains a relative term, lacking clear metes and bounds, unless defined in the claims (as in claims 2 and 14), or by an explicit definition in the specification or in cited relevant Prior art. Page 9, lines 8-11 gives a preferably range, but this is NOT a definition of the meaning of "thin film" in this context, hence the term must be considered relative, or vague and indefinite.

7. Claims 1-9, 11-21 and 23-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, line 6 "pressing the electrode against the processing subject" (emphasis added) literally means that the electrode must be made to touch the subject, however the next line requires "a thin film" to be found there between, which contradicts the "against", unless there is sufficient roughness or unevenness for the two to be touching, i.e. against each other, with a discontinuous thin film between that doesn't hold them apart.. Of course, if the subject is conductive to enable the claimed discharge processing to occur, shorting out, i.e. a short circuit will occur. Given disclosure as on p.9 or given claim 2, this does not seem likely to be the intent. On the other hand, "contract area" also requires touching or contact. For a continuous thin film to remain after/during pressing, it would be appropriate to say -- pressing the electrode towards the processing subject so as to form a thin film...-- Otherwise as noted above, the use of "against" ambiguously suggests that one is squeezing out sufficient of the viscous

insulating process medium to enable touching required by "against". Given the various contradicting limitations, exactly what is intended remains uncertain.

Apparatus claim 13 has like problems / considerations in lines 5-6, stating "a pressing unit which presses an electrode against a processing subject...to form a thin film...".

Please show clear support and rational when clarifying these issues.

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1, 13 and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Itoh (USPN 5,276,302).

Itoh (302) teaches electric discharge machining (EPM) of a workpiece via an electrode through a machining solution that fills gap G, therebetween. See Fig. 1-2 and Col. 1, noting that the solution in the

gap reads on the claimed thin film, especially given teachings that the gap (inter-electrode) voltage, V_G = O V during a short circuit period and 20V to 30V during an arc discharge period (Col. 1, lines 35-41 and 49-52+). Given that neither applicant's process nor apparatus need produce or be capable of any specific processing results, either of these events and their voltages of zero or 20 Volts read on the claimed limitations. As is typical for machining solutions for EDM, that of Itoh (302) acts as a dielectric (col.5, lines 63-66) and as part their discharge processing. See flow charts of Fig. 3 and 6. Itoh (302) determines the surface area by the capacitance structure of the electrode + opposed workpiece as discussed on Col.6, where the electrode is initially explicitly lowered so as to contact the workpiece, i.e. the gap and the voltage to essentially so as to contact the workspace, i.e. The gap and the voltage go to essentially zero. Subsequently the gap is increased, hence controlling thickness by removing contact (i.e. change contact area), via movement upward as exemplified to 10μm. Itoh notes that optimization of processing current varies according to both type of electrode material and workpiece material (col. 7, lines 29-47, and Fig.8), which would inherently be related to voltage used in processing an noted in Col.1.

Itoh teaches further control of process parameters to effect the process results of removal rate efficiency, including various means of effecting the circulation (exemplified by pumping or by "jumping" the electrode, i.e. moving it up and down), which effects sludge accumulation, thus inherently effecting the viscosity of medium between the electrodes as sludge will thicken viscosity, and its removal through either pumped flow or jumping the electrode will thin the viscosity. Also, the movement of the electrode up and down is a relative rate control. See Col.4; line 26-65; and Col.7, lines 48-Col.8, esp. lines 25-53. Also, flow rate will effect cooling (i.e. temperature, hence viscosity), as noted on Col.9, lines 20-32.

For the apparatus, particularly note the circuitry in Fig. 2, including switches 100 and 34, which will regulate and control discharge and accumulation; capacitance sensor (110); symbols which illustrates a rectangular square wave oscillator (36) derived from a H.F. power supply (112), and switched with D.C. (32).

10. Claims 2 and 14 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Itoh (302).

Note that since Itoh explicitly teaches gap equal essentially zero (contract between electrode and work piece) and increasing gap size for use at 10 μm to 30 μm, therefore the thin film of processing solution in the gap inherently is in the claimed range of 0.1 to 1 μm during the transition between contact and 10^{+} μm. Alternatively, as against or contacting require touching, available space for residue processing medium left under such conditions would have been expected to have been of like dimensions, dependent on relative roughness or smoothness of the two contacting surfaces and their resilience.

11. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh (302), as applied to claims 1-2, 13-14 and 25 above, and further in view of Itoh (4,892,989) or (4,602,142).

While Itoh (302)'s circuitry makes use of the property of capacitance, and measuring it, there are no necessary capacitors taught therein in the position claimed, however analogous teachings also by Itoh (989 or 142), which are also interested in sludge removal, fluid flow, etc., show use of capacitors as claimed in controlling abnormal discharges. In Itoh (989), see abstract; col. 1; col.3, line 27-38; Fig. 2; col. 4, line 62-66; col. 11, lines 34-68+; and Fig. 9 & 7 generally; plus Fig. 6 (ref # 154) 7, 3 (C_1), and 11 (C_{10}); and col. 5, lines 13-33; col. 6, line 23-35; col. 7, lines 19-30^{+}; and in Itoh (142), see abstract; Fig 1-2; col. 1 and summary generally; plus Fig 10 (C_{10}) discussed on col. 8-9 where discharge of capacitor C_{10} controls the size of the gap.

12. Claims 11, 23 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh (302) as applied to claims 1-2, 13-14 and 25 above, and further in view of Itoh (4,798,929) alone, or with Itoh (989 or 142).

Itoh (302) does not use a wire electrode, however, Itoh (929) shows that EDM processing using electrodes that are wires have like considerations for control of discharging conditions, via fluid flow or renewal gap of width, as do the bulkier electrodes of (302). In Itoh (929), see the abstract; Fig. 1-2, 8-9,

11-12, 17-19; col. 1, lines 6-37; col.2, lines 11-36 and 45-63; and Fig. 4 (ref # 119), Fig 9 (ref # 102), Fig 15 (ref # C_{10}) and Fig. 22 with pulse generator for capacitor related teachings. Given analogous use in machining, with analogous process and control concerns, it would have been obvious to use the (929) wire electrode in the process of (302), with appropriate suggested procedural modifications that pertain to the wire configuration. Note as the wire is employed in machining, it may be said to be pressed (relatively) towards the substrate in the direction of the machining. While Itoh (929) supplies incentive to employ capacitors as claimed in the electronics for control purposes, the (989) or (142) references supply additional motivation by demonstrating the equivalent usage for the alternate form of electrode used the primary reference.

13. Claims 2-5, 12, 14-17 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh (302) as applied to claims 1-2,13-14 and 25 above, and further in view of Muro et al (5,676,860)

Itoh (302) does not teach any specific type of insulating processing media to be used nor specifically discuss relative spiral motions or rotating the electrode, however Muro et al who is also teaching an EDM process where motion is employed to effect removal of accumulated debris to stabilize condition of the gap and the discharge (abstract; figure 1, 6-7; background; and summary), exemplify the processing liquid bath that is analogues to that of Itoh (302) as being an insulting oil (col. 2, lines 50-54) or mineral oil (col. 3, line 42). These oils are types of lubricants, and grease and oil are synonyms. It would have been obvious to one ordinary skill in the art to use oils as suggested by Muro et al in the process of Itoh (302), as the EDM procedures of both concern like processes and results, and as no particular processing media is disclosed in the primary reference, one of ordinary skill would have looked to the prior art for effective examples of such media, which Muro et al provides.

Muro et al, who are also concerned with short circuits, arc discharging and processing, give exemplary discharging gas as 1 μm (for W electrode and mineral oil), where rotation of the electrode is employed (as well as relative movement of object by vibration), to enable debris removal, a feed speed is

also employed while processing, and to adjust gap distance due to short circuits or arcing, the gap may be raised or lowered in the electrode Z-axis, thus effecting a spiral motion due to the rotations that would be simultaneously occurring. Muro et al does not discuss any values for Vg (gap discharged voltage), however as seen in Itoh (320) on occurrence of a short, Vg =0, and otherwise Vg is dependent on electrode, object, processing media, debris and supply voltage (col. 3 line 43 give 80V supplied in Muro et al, W electrode example, but how this relates to Vg cannot be determined by the examiner). As Itoh (302) is generic for EDM processing and they teach that alternate solution flow effecting procedure may be used to effect their desired results of accumulation removal via flow and resultant Vg control, the procedure of Muro et al would have been obvious to apply to Itoh (302) teachings. Also, Muro et al demonstrates the utility of smaller gap of 1μm for general processing, not just during the evaluations procedures, hence given the teaching on optimization due to materials, etc (col. 7), it would have been obvious to employ gaps on the order of 1μm as demonstrated by Muro et al, optimized for the particular materials, with routinely determined optimized current and Vg by following general procedure of Itoh (302).

14. Claims 7 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh (302), in view of Muro et al (860) as applied to claims 1-5, 12, 13-17 and 24-25 above, and further in view of JP6-210,517 (Takahashi & Okura).

The generic procedures of the above combination with Itoh (302) + Muro et al, do not discuss the use of powders, such as powdered Si, in the processing medium, however depending on the desired results powders are conventionally used in processing media to supply specific material or effects. Takahashi et al teach an oily electric discharge machining liquid (claims; p.1 or [0003], full translation or in English abstracts), hence is commensurate in scope with the fluid suggested for use (oil) in the above combination. In the translation, in [0003] and [0014-0018], it is noted that deterioration of oil may generate sludge with attendant stability problems, etc., and is also a concern of both Itoh (302) and Muro

et al. On page 16 +, Takahashi et al discuss various common types of oily fluids for EDM processing, and additives therefore, with [0045] listing various base oil fluids, [0046-0053] discuss the use of powder, including Si [0052] in the oily fluid, where the function of the powders are suggested to significantly planarize the surface of the object being processed. Therefore, it would have been obvious to one of ordinary skill in the art to employ the Si powder in the medium of Itoh (302) + Muro et al, as Takahashi et al show such powders are conventional additives, and because they provide for the advantage of planarization where a removal operation is desired.

15. Claims 6 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh (302) as applied to claims 1-2, 13-14 and 25 above, and further in view of Inoue (4,130,493).

Itoh (302) does not disclose any particular processing media, so one of ordinary skill would have looked to prior art for suitable substances. Inoue (493) discusses various fluids, such as Kerosene and distilled H_2O in the their background, and their pros and cons, including the advantage for removing debris of low viscosity, such as aqueous machining fluids, but disadvantages of water base like rusting that, oil based like kerosene do not have. Inoue (493) propose additives to aqueous fluids that include organic material, such as saccharides (glucose...sucrose...starch), a nitrogen source and inorganic salts like Mg SO_4, $NaPO_4$, acidic KPO_4, $FeSO_4$, and Zn SO_4, which overcome disadvantages discussed for conventional machining fluids. The organic saccharides are all water soluble, and notice is taken that a traditional use of such glucose or starch material is as a thickening or gelling agent, hence H_2O absorption is a known ability of such compositional components.

It would have been obvious to one of ordinary skill in the art to use machining fluids as taught by Inoue (493) in the process of Itoh (302), for the advantages over conventional fluids provide therein.

16. The dictionary definitions in Hawley's... and Hackh's..., provide teaching on water absorption, particularly note p. 564 or 1085-1086, respectively, that support the above notice.

17. Claims 8-9 and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itoh (302) as applied to claims 1-2, 13-14 and 24 above, and further in view of JP8-300,227 (variously called Shingiyutsu et al or Saito et al, and discussed in sections 4 & 6 of paper# 3 mailed 11/7/03 and sections 4-6 of paper# 5 mailed 5/21/03).

Itoh (302) does not discuses how his generic electrodes are made, but does make clear that the process may be optimized depending on electrode material used, hence suggesting use of any electrodes known to be used for EDM processing. As previous noted, the Saito et al (227) reference (see Fig. 13 and p. 4-6 of translation by PTO) teach compression molded electrodes for use in baths with a gap filled with processing fluid between the electrode and object being processed, hence it would have been obvious to one of ordinary skill in the art, that compression molded electrodes would have been expected to be effective types to employ in Itoh (302)'s processing, as analogous configurations are employed; Saito et al (227) supplies particular material and enduses for the generic disclosure of the primary reference, wherein the advantages of the control and circulation processes would have been expected to be advantageous.

18. Other art of interest includes Magara (5,118,915), who discusses Vg=20-30 V and use of Si powder in machining solution, with its effect on the gap size, which is relevant to claims 7 & 19. Nanasawa et al discusses wire electrodes and the important variables that effect the size of the gap in electric discharge processing.

19. Any inquiry concerning this communication should be directed to Marianne L. Padgett at telephone number (571) 272-1425 on M-F from about 8:30 am - 4:30 pm, & FAX#(703) 872-9306 (all official).

MARIANNE PADGETT
PRIMARY EXAMINER

M. L. Padgett/af

March 10, 2004 & March 24, 2004